REMARKS

Favorable reconsideration and allowance of the present application is respectfully requested.

Claims 95-135, including independent claims 95, 112, and 126, are currently pending in the present application. Independent claim 95, for instance, is directed to a method for forming a paper web that contains a first layer formed primarily from hardwood fibers. The method comprises treating the hardwood fibers with a first hydrolytic enzyme to hydrolyze and form aldehyde groups predominantly on the surface thereof, wherein the dosage of the hydrolytic enzyme is from about 0.1 to about 10 s.e.u. per gram of oven-dried pulp. The first hydrolytic enzyme comprises a cellulosic-binding domain free endo-glucanase. In addition, the method also comprises treating the hardwood fibers with a cross-linking agent that forms a bond with the aldehyde groups on the surface of the hardwood fibers.

In the Office Action, original claims 43-81 were rejected under 35 U.S.C. §103(a) as being obvious over WO 98/56981 to Seger, et al. Seger, et al. is directed to modified cellulosic fibers having a reduced dry zero span tensile index. To obtain the modified cellulosic fibers, a cellulase-containing enzyme is added to an aqueous slurry of fibers. (pg. 13). The enzyme modifies the morphology of the fibers. (pg. 13). After mixing of the fibers and enzyme preparation, the mixture is preferably, though not necessarily, combined with a debonder or chemical softener to preserve the fiber morphology that results from enzymatic action. (pg. 13). Specifically, Seger, et al. indicates that the addition of a debonder to wet enzyme-modified fibers prevents the "repair" of the fibers that would otherwise take place upon drying. (pg. 17).

However, Applicants believe that the enzymes referred to in Seger, et al. (e.g., Cellucast®, Celluzyme®, Pergolase®, and Carezyme®) possess a cellulosing-binding domain that attaches to the fiber surface and hydrolyzes the cell wall. This weakens the fibers, thereby making them more flexible and providing a reduced zero span tensile strength. On the other hand, the enzyme of independent claims 95, 112, and 126 includes a cellulosic-binding domain free ("truncated") endo-glucanase. Examples of such cellulosic-binding domain free endo-glucanases include NOVOZYME 613, SP-613, SP-988, or NS 51016, which are commercially available from NovoNordisk BioChem North America, Inc. (Appl. pg. 9). Because these enzymes do not contain a cellulosic-binding domain, they only hydrolyze the surface of the fibers, without substantially weakening the fibers. Based on the express teachings of Seger, et al. to enhance fiber flexibility and reduce zero span tensile strength, Applicants respectfully submit that one of ordinary skill in the art would not have found it obvious to utilize a cellulosic-binding domain free endo-glucanase as set forth in independent claims 95, 112, and 126.

In addition, Seger, et al. also fails to recognize the synergistic combination of web construction, enzyme treatment, and cross-linking achieved according to independent claims 95, 112, and 126. Independent claim 95, for instance, requires that the paper web contain a layer formed primarily from hardwood fibers. By containing hardwood fibers, the layer is relatively soft in comparison to layers formed with certain other types of fibers. However, soft fibers also tend to result in a layer that is weaker and has higher levels of lint and slough.

To counteract this tendency, Applicants have discovered that a combination of a specific dosage of a hydrolytic enzyme and a cross-linking agent in the hardwood fiber layer can reduce lint and slough without substantially sacrificing softness. Specifically, the hydrolytic enzyme hydrolyzes the hardwood fibers and forms aldehyde groups predominantly on the surface thereof. These aldehyde groups become sites for cross-linking. Thus, the cross-linking agent forms a "bridge" between the aldehyde groups of two or more enzyme-treated fibers. For example, one hydroxy moiety of starch can form a glycosidic bond with an aldehyde moiety of one enzyme-treated fiber, while another hydroxy moiety of starch can form a glycosidic bond with an aldehyde moiety of another enzyme-treated fiber. (Appl. pg. 14). In addition, by randomly cutting or hydrolyzing the fiber cellulose predominantly at or near the surface of the fiber, degradation of the interior of the fiber cell wall is avoided or minimized. Consequently, the resulting paper web exhibits reduced levels of lint and slough.

Seger, et al. does mention that starch binders may be included in the papermaking fibers to reduce linting. (pgs. 21-22). However, Seger, et al. fails to recognize the ability of a cross-linking agent to form a "bridge" between enzyme-treated fibers as described above. Furthermore, Seger, et al. also fails to recognize the combination of each of these aspects with the specific web construction that includes a layer of primarily hardwood fibers treated with both an enzyme and a cross-linking agent, which provides a synergistic paper web that is soft, strong, and has low levels of lint and slough. Thus, when viewing the teachings of Seger, et al. in their entirety, one of ordinary skill in the art would simply not have found it obvious to achieve the aspects of claims 95, 112, and 126.

In summary, Applicants respectfully submit that the present claims satisfy all the requirements of 35 U.S.C. §112 and patentably define over the prior art of record for at least the reasons set forth above. As such, it is believed that the present application is in complete condition for allowance and favorable action, therefore, is respectfully requested. Examiner Chin is invited and encouraged to telephone the undersigned, however, should any issues remain after consideration of this response.

Please charge any additional fees required by this Amendment to Deposit Account No. 04-1403.

Respectfully submitted,

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